Temporal Dynamics of Extraction From Wh-Islands: A Speed-Accuracy Trade-Off Study

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TEMPORAL DYNAMICS OF EXTRACTION FROM WH-ISLANDS: A SPEED-ACCURACY TRADE-OFF STUDY
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METHOD

Participants: 15 French-speaking adults
Material: 36 sets of 16 sentences, each set composed by:
• 4 experimental sentences in which a sentence-initial wh-element (Wh1) has been extracted from the object position of a verb over a second wh-element (Wh2) serving as the subject of the verb. The lexical restriction of both Wh1 and Wh2 was manipulated in a 2x2 full crossed design, as illustrated below:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Wh1</th>
<th>Wh2</th>
<th>Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bare-Bare</td>
<td>+Q -Q</td>
<td>(What do you wonder who built ? ?)</td>
<td></td>
</tr>
<tr>
<td>Bare-Restricted</td>
<td>+Q -Q</td>
<td>(What do you believe that John built ? ?)</td>
<td></td>
</tr>
<tr>
<td>Restricted-Bare</td>
<td>+Q -Q</td>
<td>(Which building do you wonder who built ? ?)</td>
<td></td>
</tr>
<tr>
<td>Restricted-Restricted</td>
<td>+Q -Q</td>
<td>(Which building do you wonder which engineer built ? ?)</td>
<td></td>
</tr>
</tbody>
</table>

• 4 corresponding ungrammatical sentences used to derive false alarms rates for scaling d’ functions (e.g., What/Which building do you wonder who/which engineer slept?).
• 4 sentences without extraction (e.g., Who/Which tourist wonders who/which engineer built this building?).
• 4 ungrammatical sentences without extraction (e.g., Who/Which tourist wonders who/which engineer slept this building?).

The experimental sentences were intermixed with 160 filler sentences.

Procedure: Sentences were presented once a phrase at the time, and participants were asked to make yes/no acceptability judgments at each of 18 tones presented at 250 ms intervals at the onset of the last phrase.

Data Analysis: Full time course SAT functions are modeled as an exponential approach to a limit: d’(t) = λ(1 - e^-βt), for t > 0, else 0

λ = asymptote (providing a measure of the overall probability of retrieval)
β = rate of raise (indicating the rate at which accuracy grows from chance to asymptote)
δ = intercept (the point at which information first becomes available)

RESULTS

ANOVA on asymptotic values:
Effect of Wh1 (F(1,14) = 31.74, p < .001)
Effect of Wh2 (F(1,14) = 20.83, p < .001)
No interaction
Best fit: 4λ - 2β -1δ
Adjusted R²: 0.999

λ (conditions (a)-(d)): 1.09, 1.75, 2.59, 3.18
β (conditions (a) and (b)-(d)): 2.17, 1.29
δ (common): 0.844

Analysis of processing speed (β parameter) reveals that Bare Identity was processed, on average, twice as fast as the other 3 conditions. Inspection of individual subjects’ functions for this condition (Fig. 2) revealed that this difference is due to a clear non-monotonicity in the dynamics: 11 of the 15 subjects showed disproportionately high acceptance rates for Bare Identity early in processing, which were reversed later in processing.

CONCLUSIONS

1. Analysis of asymptotic accuracy reveals: Bare Identity < Inverse Inclusion < Inclusion < Complex Identity.
This pattern follows predictions from Cue-based memory models, according to which richer encoding of the extracted element increases the likelihood of cues making direct contact to it, while richer encoding of the interveners decreases their potential to engender interference.

2. Analysis of processing speed reveals no differences in the dynamics of the four structures.

3. Non-monotonicity is clearly manifest in Bare Identity, and actually also in the other conditions following an inverse relation with the overall acceptability of the structures. Non-monotonicity demonstrates that at least two types of processing are operative in interpreting the structures. The early rise in acceptability likely reflects processing of verb subcategorization constraints, which require retrieving the extracted element and assigning it to the direct object position (SO). The subsequent decrease in acceptability could be due to syntactic constraints of the type proposed by Relativized Minimality, but are perhaps more plausibly seen as interpretive constraints (e.g., well-formativeness of questions).

REFERENCES